Summary Report for Geometry

Carnegie Learning, Inc.
Geometry: Common Core Math Course, Geometry

Degree of Evidence regarding the Standards for Mathematical Practice:

Limited Evidence

Summary of evidence:

1. **Make sense of problems and persevere in solving them**. In the chapters reviewed, there are opportunities for students to analyze the mathematics and to explain their findings, both within the student textbook and the student assignments. The Teacher Implementation Guide directs teachers to have students work in groups on particular problems and then to share their finding with the class. Open-ended questions are mainly presented as investigations, resulting in fewer open-ended questions in the student practice problems. In the chapters reviewed, there are no opportunities for students to reflect on their answers to practice problems, and reflection would depend on teacher implementation. Some open-ended problem-solving opportunities are available for students as they discover the concepts for themselves. There is limited opportunity for students to create a problem-solving plan and to carry it out, checking their results for accuracy. Typically, the problem solutions are presented to the students, who are directed to solve the practice problems in much the same manner. The Teacher Implementation Guide does advocate for cooperative learning groups.
2. **Reason abstractly and quantitatively**. In the chapters reviewed, application problems are typically presented as introductory problems for each chapter. There seem to be very few application problems present in the student assignments and skills practice. Students are frequently asked to create a model for the problem situation. For example, within the unit on solids, students worked some with nets. Students are frequently led to derive the formulas through investigations and then to represent their findings using symbolic notation (e.g. Lesson 8.4 – Decomposing Polygons). Units are used throughout the text in all problems. Students work with both exact values and decimal approximations (e.g. p.221 Problem 2). Students are rarely expected to determine reasonableness. There are application problems and examples in each unit, though significantly less can be found in the assignment problems. Questions are geared towards students discovering the algorithm for the mathematics or the formula on their own or in groups, rather than just being presented with the formula from the start.
3. **Construct viable arguments and critique the reasoning of others**. The opportunities for students to explain their reasoning are found in the student text and assignments. The Teacher Implementation Guide directs teachers to have students work in groups and share their methods and results with others, but these opportunities would depend on teacher implementation. Discussions of justification are limited, in the chapters reviewed, and would be up to the teacher to facilitate. The opportunities for students to justify their thinking are available, pending teacher incorporation. This text provides ways to incorporate the critiquing of the reasoning of others, but will rely some on teacher facilitation of the investigations. The Teacher Implementation Guide does not give the teacher any tips on how to foster this communication, other than to say to have students discuss in groups.
4. **Model with mathematics**. In the chapters reviewed, students are frequently asked to work with models to represent the problem scenario, but students are typically directed to a specific model to use with no choice of their own. The investigative problems sometimes have students make

connections between prior knowledge and new knowledge. In the application questions, answers are in context. As students progress in their understanding of the concept covered in the lesson, they continue to build the connection among tables, equations, and situations. There are opportunities for students to create and work with specific models while grappling with the concepts they are asked to discover on their own. Students move from the models to the symbolic representations or formulas they have conjectured and tested on their own.

5. **Use appropriate tools strategically.** Geometric constructions are presented throughout the text. Constructions are used as a tool to explore geometric concepts rather than as a separate concept of its own. Students are asked to use rulers, protractors, patty paper, 3-d models, nets, and so on within investigations and practice problems. The use of graphing calculators does not seem to be discussed other than in the concepts involving trigonometry (e.g. p.380). In the chapters reviewed, there did not seem to be any mention about using geometric computer software to aid in student understanding. There is little mention of technology use in the student or the teacher guide. Geometric constructions are presented as a tool for investigating geometric properties. In the chapters reviewed no evidence was found regarding the evaluation of the strength and weaknesses of certain tools with respect to the problem scenario.
6. **Attend to precision.** Examples use proper notation and are precise, but the teacher would have to bring the need for precision to light. Students are asked to round to various decimal places. In the chapters reviewed, the importance of precise communication is not evident in any of the resources. There are a few problems where students are asked to conduct error analysis to correct misconceptions presented in a particular solution or statement. Students are given opportunities to share their solutions and compare their findings within their cooperative learning groups, but this is dependent on teacher implementation. There is attention to precision in the examples. The opportunity for students to discuss using precise communication is not evident and would rely on teacher implementation.
7. **Look for and make use of structure**. There are some opportunities for students to look at examples and then generalize the mathematics (e.g. pp.455-457). Students are usually asked to discover the mathematical rule for themselves through the investigations. Students then complete the rule or formula in their own words. Many activities explore patterns to create generalizations (e.g. p.244). There is little connection to prior learning. There are many opportunities for students to generalize their findings. The rule is not given to the students in the text, thereby encouraging them to complete the investigation on their own to determine the rule.
8. **Look for and express regularity in repeated reasoning.** There are frequent examples where the resource asks students to look at patterns. The teacher implementation guide states to have students discuss their findings with each other in order to arrive at a generalization. Questions lead students to develop formulas. For example, students derive the interior and exterior angle sum of a polygon on their own by completing discovery activities. Overall, there are many opportunities for students to generalize a pattern to determine a rule. The structure of the text is for students to discover the geometric truths on their own through guided investigations. Students are asked to generalize their findings.